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Feb. 12/81

0010-32.3

ONTARIO DEPARTMENT OF AGRICULTURE

TORONTO, MARCH, 1895.

BULLETIN (SPECIAL).

PLANTING AND CARING FOR YOUNG TREES IN AN APPLE ORCHARD.

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One of the first requisites to successful orcharding is to begin well. This bulletin briefly outlines for the guidance of intending planters some of the chief points which should be considered.

LOCATION AND EXPOSURE. In selecting the site for an orchard two of the main things to be sought for are exemption from late spring and early autumn frosts, and shelter from the prevailing high winds. The locations least subject to injurious frosts are those bordering large bodies of water, and, in the interior, the high lands. It is important to plant apple trees on the highest land available. If the elevation is not more than ten feet above the general level of the adjacent land, it affords an advantage in allowing the cold air to drain away into the lower levels, and lessens the danger from frosts, which often do great injury when the trees are in bloom. One of the worst locations is a sheltered valley from which there is little or no atmospheric drainage, and into which the sun shining makes it the hottest spot during the day, while the cold air settling into it from the higher elevations makes it the coldest spot during the night.

A free circulation of air is very desirable in an orchard, and a full exposure is better than shutting it in too closely, yet it is advisable to have orchard somewhat sheltered from the full force of the prevailing winds. These in most parts of the country come from the southwest. The shelter therefore should be on that side and may consist of a strip of woodland, or a belt of Norway spruce put out at the same time as the orchard, or best of all, if possible, plant the orchard on a hillside having a northern or northeastern exposure. Such a location and exposure is least subject to sudden changes of temperature, drouth and the prevailing high winds.

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THE SOIL AND ITS PREPARATION. Apples may be successfully grown on a great variety of soils, from a moderately light sand to a heavy clay. The best soil, however, is a deep, open, clayey loam, which should be well drained either naturally or artificially. In addition to this it should be moderately rich and retentive of plant food, for it is impossible to raise good fruit on poor soil.

To prepare the land for planting it should be plowed deeply in the fall and put in good condition in the spring as if prepared for a hoed crop. If the subsoil is a hard clay into which the roots of the trees cannot readily enter, it should be loosened up by means of a sub-soil plow. Where it is not convenient to treat the whole ground in this way, do a strip at least five or six feet wide where each row of trees is to stand, or when planting dig the holes much wider and deeper than would be otherwise necessary for planting.

DISTANCE APART FOR PLANTING. It is impossible to state any particular distance apart for planting which would be suitable for all conditions. The rule should be to allow space enough so that when the trees are full grown the tops will yet be a few feet apart. This allows the free admission of sunlight so necessary in producing well colored fruit. The ultimate size of a tree will depend much upon the variety, and the soil upon which it is grown. Varieties such as the Ben Davis or Ontario, for instance, require much less room than large growing varieties such as the Greening or Baldwin, while a tree of any given variety will grow much larger or smaller than usual according as it is grown on richer or poorer soil. The best guide to intending planters is to observe the distances apart of full-grown thrifty trees in the neighborhood. These will be found to vary with different varieties in different sections all the way from twenty-five feet in the case of the smaller growing varieties to forty feet in the case of those varieties that spread. The average distance will be about thirty feet. It will be found to be better to keep them a little too far apart rather than to crowd them.

ARRANGEMENT OF TREES. There are several methods of arranging the trees in an orchard. The one usually adopted is the square; most used no doubt because many do not know of a better. By this arrangement the trees are planted in rows the same distance apart each way, four trees forming a square. A much better plan is what is known as the hexagonal. By this system fifteen per cent. more trees can be grown per acre without the least bit more crowding—no small item when we consider that the profits per acre are increased accordingly. By the hexagonal arrangement the trees in the second row are set alternating with those in the first; six trees forming a hexagon and enclosing a seventh in the centre. To ascertain the correct position for the first tree in the second row, and consequently the distance apart of the rows that way of the orchard,

take two strings the same length as the distance apart at which the trees are to be planted, fasten the end of one to the first and the other to the second stake in the first row, then stretch the free ends out till they meet, this point will mark the position for the first tree in the second row.

Whichever method of arrangement is adopted the trees should be set in perfectly straight lines, the first tree, no matter which way we look, hiding every other tree in the row. Crooked rows are not only an eyesore, but during cultivation they endanger the lives of the trees as well as the morals of the man who has to cultivate them. To assist in getting the rows straight, the position of each tree should be marked by a little stake before the holes are dug. Then when planting use a "planting board." This may be five or six feet long and six inches wide, with a notch in one side at the middle, just large enough to let in the trunk of a small tree, and a hole at each end at equal distances from this notch. When a hole is to be dug place this notch about the stake and put a peg through each hole at the end. The board may then be taken up and the hole dug. When the tree is to be planted replace the board over the pegs and place the tree in the notch. It will thus stand in the exact position as the stake which marked the hole.

FERTILIZATION OF BLOSSOMS. That the blossoms of a tree may "set" or become fruit, they must be fertilized with pollen from their own or some other tree. It has long been known, however, that nature abhors self-fertilization, and that she resorts to various modifications of the flower to prevent it and thus secure if possible cross-fertilization. Bees and other insects flying from flower to flower are the chief agents in distributing the pollen and bringing about cross-fertilization.

In accord with this many varieties of apples have been found to be more or less self-sterile—that is, their pollen will not properly fertilize their own blossoms, although it may be quite potent on the blossoms of some other variety. Recent experiments conducted by the United States Department of Agriculture have clearly shown this to be the case with many varieties of pears, and even those varieties which are self-fertile were found to bear larger fruit and more of it, when fertilized with pollen from some other variety.

In planting an orchard, therefore, while it is well to avoid planting a multiplicity of varieties, yet it is important to avoid planting too large a block of any one variety.

TRANSPLANTING. There is quite a diversity of opinion as to the proper time for planting trees. It may be done in either spring or fall when the tree is dormant. As a rule, however, planting in early spring is the safest in our climate.

If, when the trees arrive from the nursery, it is not convenient to plant them at once, they should be "heeled in" by placing the roots in a trench and covering them with mellow soil, well packed, to prevent their drying out. Never allow the roots to be exposed to the sun or wind any more than can be helped.

No matter how carefully a tree has been taken up, its roots are always more or less mutilated and broken. All such injured roots and broken ends should be cut back with a smooth cut to sound wood. That a newly planted tree may flourish, it is necessary that a balance should exist between the roots and tops or branches, consequently when transplanting the tops should be cut back to correspond with the roots that remain.

The hole should be dug wide enough to allow the roots to be extended freely in all directions, and deep enough, that, after a few inches of surface soil have been filled in the bottom, the tree will then stand about the same depth as it stood in the nursery. Spread the roots out carefully in their natural positions and cover them with moist, mellow surface soil. When the hole is about half filled, get in and tramp the earth firmly about the roots. Omitting to do this is one of the most frequent causes of failure in transplanting. If watering is necessary a pail full may then be added, but this is seldom necessary except in a very dry time. The balance of soil being filled in and tramped firmly, a couple of inches on top should be left loose and untramped. This acts as a natural mulch, checking the evaporation of moisture from below.

MULCHING. When the tree is planted spread around it as far as the roots extend, or a little beyond, a five or six-inch covering of coarse stable manure, or other loose material which will act as a mulch. This is particularly necessary in a dry soil or in a dry season. It prevents baking and cracking of surface soil and consequent escape of soil moisture from below, and at the same time maintains a uniformity of heat and moisture which is highly favorable to the formation of new roots.

CULTIVATION AND CROPPING. One of the most important factors in determining the profits from an orchard is good cultivation. Sod should never be allowed around young trees. For the first five or six years some hoed-crop, such as roots, potatoes, beans or corn, may be grown in the orchard. The cultivation required to grow these profitably will keep the ground in good condition for the trees, while such crops will yield a return from the land until the trees themselves begin bearing. Never sow a grain crop in a young orchard unless a strip, at least as wide as the height of the trees, is left on each side of the rows and kept well cultivated.

The roots of a tree generally extend as far below ground laterally as the top spreads above it, and they should be the sole occupants of the

ground as far as they extend. Cropping between the rows, therefore, must gradually decrease as the trees increase in size, and should be discontinued altogether as soon as the trees fully occupy the ground.

Cultivation about the trees should never be so deep as to interfere with the roots. Shallow, level cultivation is much safer than plowing. By using the spring tooth cultivator to loosen up the ground, and the broad share cultivator to keep the weeds down, plowing may profitably be dispensed with altogether.

Cultivation should commence in the spring as soon as the ground is fit to work, and be continued as often as necessary until about the middle of August. By ceasing cultivation at that time the trees are more likely to stop growing and ripen up their wood so that it will not be injured by severe freezing. The frequency of cultivation necessary will depend much upon the soil and season. The aim should be to keep the surface soil loose and open, thus acting as a natural mulch and enabling the trees to withstand the injurious effects of drouth at any time.

MANURING. Manuring an orchard in order to obtain good crops of fruit is often just as necessary as manuring a field to get a good crop of corn or roots. In a young orchard where hoed-crops are grown, the manure applied to grow these profitably will be all that is required by the young trees, as they will get their share of it. The vigor of the hoed-crop will be a good indicator of the quantity of manure necessary for the trees. In older orchards where there is no cropping, the annual growth of the new wood is the best guide in applying manure.

As a general fertilizer nothing is better than barnyard manure, but it should be withheld where the new growth is excessive or where the wood growth is at the expense of fruit.

Unleached wood ashes are a specific fertilizer for fruit trees, as they contain all the inorganic elements necessary in producing both tree and fruit. Unlike barnyard manure they tend to promote fruitfulness rather than excessive wood growth, and may safely be applied at any time.

In applying fertilizers of any kind never bank them about the trunk of a tree, but spread them evenly all over the ground as far out as the roots extend.

PRUNING. One of the first things to be considered in pruning a young orchard is the height at which the heads should be started. Some prefer low heads and others high heads. Either extreme should be avoided. From four to four and a half feet is a convenient height for apple trees. To have them all alike cut them back when young to the desired height. Three branches are enough to leave to start the head. Space these evenly, and direct new growth when-

ever necessary by cutting back to a bud pointing in the direction you wish the new branch to take. The ideal pruning consists rather in directing growth than in cutting out what has grown. Thin out the new shoots as may be required to keep the head from becoming too crowded. Cut out any branches that cross or rub each other, and keep the top symmetrical by cutting back branches growing too fast in any particular direction, as they are often inclined to do on the leeward side.

If an orchard is pruned regularly every year, as it should be, there need be no necessity for cutting out large limbs, and the pruning at any time will be very light. Light pruning may be done at any time during the summer, but for the general, annual pruning, this had better be done early in spring before the growth starts.

PROTECTING THE TRUNKS FROM BORERS. One of the most destructive insects to newly transplanted trees is the flat-headed apple tree borer. The mature insect is an active little beetle, nearly half an inch long, which lays its eggs on the bark of the trees, generally on the southwest side. When the egg hatches the larva eats its way through the bark where it feeds upon the sap-wood, sometimes entirely girdling the tree. When full grown it is a pale, yellow, footless grub, over half an inch long, with a large flattened head. The presence of these pests in infested trees may readily be detected by the blackened and deadened appearance of the bark over the parts where the borers are at work.

When borers get into a tree there is no other remedy than cutting them out with a sharp knife, or killing them in their burrows with a stout wire. But prevention is better than remedy, and the injury from borers can easily be prevented. To do so wash the trunks and larger branches with a mixture of soft soap reduced to the consistency of thick paint with a solution of washing soda. If just enough carbolic acid is added to give it a strong smell it will be all the more repulsive to the beetles. This should be applied during the early part of June and again early in July when the beetles are most active in laying their eggs.

SPRAYING. The whole host of leaf-eating insects which feed on the apple tree, such as the Tent caterpillar, Red-humped apple tree caterpillar, Yellow-necked apple tree caterpillar, Fall web worm, Tussock moth, canker worms, etc., must be fought with Paris green, used at the rate of 1 lb. to 250 gallons of water.

Other insects which suck the juices from the leaves and young wood, such as the aphis, tree cricket and bark louse, must be destroyed by the kerosene emulsion. This is made according to the following formula: Hard soap $\frac{1}{2}$ lb. (or soft soap about $\frac{1}{2}$ gallon), hot water 1 gallon, coal oil 2 gallons.

Dissolve the soap in the hot water, add the coal oil, then agitate by means of a force pump or syringe for five or ten minutes until thoroughly mixed. If properly made, this, on cooling, will form a jelly-like substance, which, before using should be diluted with about fifteen parts of water.

The apple scab fungus, which affects the foliage as well as the fruit, must not be allowed to weaken the young trees before they come to a bearing age. To hold this in check, spray before the buds open with a solution made of 1 lb. of copper sulphate to 25 gallons of water; after the foliage appears spray three or four times at intervals of ten days or two weeks with the Bordeaux mixture. This, as now used, is made according to the following formula: Copper sulphate (blue vitrol) 4 lb., lime (fresh) 4 lb., water 50 gallons or one coal oil barrel.

Dissolve the copper sulphate in a wooden vessel, or in the barrel on which the force pump is mounted. To do this quickly hang it in a little cotton bag so that it will be just below the surface of the water in the barrel. In another vessel slake the lime, using plenty of water, then strain it through a bit of coarse sacking into the barrel containing the copper sulphate. Fill the barrel with water.

If the lime is fresh and pure it should neutralize all the acid in the copper sulphate solution. To test if this be the case, add to a small sample of the mixture a drop or two of ferrocyanide of potassium. If the lime is insufficient, this drop, when added, will turn brown. In that case lime-water must be added until the test gives no brown coloration.

The Bordeaux mixture and the Paris green may with advantage be applied together, thus forming a combined fungicide and insecticide. To do so add 4 ozs. of Paris green to a barrel of the mixture.

All of these mixtures should be applied in the form of a very fine spray. The "Vermorel" and "McGowen" nozzles have so far been found to be the most effective and economical for this work. These may be attached to any good, strong force pump, of which a number of Canadian makes may be found advertised in the agricultural and horticulatural journals.

SUMMARY.

1. For an orchard, select, if possible, high land with a northern or northeastern exposure.
2. A well-drained, deep, open, clayey loam is best.
3. Work the land deeply and well previous to planting.
4. Plant far enough apart that trees will not touch when full grown.
5. The hexagonal arrangement of trees in an orchard admits of 15 per cent. more trees per acre than on the square, without a bit more crowding.
6. To secure proper fertilization of blossoms, avoid planting too large a block of any one variety.
7. When transplanting, keep roots moist and pack the earth about them firmly.
8. A mulch spread about newly transplanted trees maintains a uniformity of temperature and moisture favorable to the formation of new roots.
9. Give thorough, shallow, level cultivation.
10. Cropping between the rows must gradually cease as the trees increase in size.
11. Unleached wood ashes are one of the best fertilizers for fruit trees of all kinds.
12. Like all other fertilizers, they should be spread evenly as far out as the roots extend.
13. Prune regularly every year and direct growth rather than cut out what has grown.
14. Prevent injuries from borers by coating the trunks of trees with a soft soap, soda and carbolic acid wash.
15. Spraying is often necessary on young trees while not yet of a bearing age.
16. For leaf-eating insects, use Paris green ; for sucking insects, kerosene emulsion ; and for fungous diseases, copper sulphate solution and Bordeaux mixture.
17. The Bordeaux mixture and Paris green may be applied together with advantage.